FATIGUE AND PHYSICAL RECOVERY IN BASKETBALL UNDER COVID-19

FADIGA E RECUPERAÇÃO FÍSICA NO BASQUETEBOL EM MEIO A COVID-19

FATIGA Y RECUPERACIÓN FÍSICA EN BALONCESTO EN EL MARCO DE COVID-19

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ABSTRACT

Introduction: A new research direction to strengthen basketball, improve physical function and enhance the immunity of athletes during the epidemic situation of COVID-19 is requested. Objective: Explore the specific methods of basketball fatigue and physical recovery under the outlook of COVID-19. Methods: 36 college volunteers without significant differences in height, weight, or age were randomly selected for the research. Divided into two groups, the intervention mode of the experimental group was vibration foam roller intervention, while the control group adopted the traditional walking and stretching method. The subjective assessment data of lactic acid change and exercise fatigue were collected and analyzed. Results: One hour after exercise, the rate, and decrease of lactic acid in the experimental group were statistically higher. Before the beginning of the experiment, the subjective assessment of fatigue in the control group was (16.031 ± 2.4438) points, and that in the experimental group was (16.139 ± 2.7043) points. After the end of the ninth week, the subjective assessment of fatigue in the control group was (14.646 ± 2.7453) points, while in the experimental group, it was (11.576 ± 3.2552). Conclusion: The vibrating foam roller massage method can recover athletes from muscle fatigue more efficiently while respecting the limitations imposed by the epidemic situation. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: COVID-19; Fatigue; Recovery of Function.

RESUMO

Introdução: Uma nova direção de pesquisa para fortalecer o basquetebol, melhorar o nível da função física e aumentar a imunidade dos atletas sob a situação epidêmica da COVID-19 é requisitada. Objetivo: Explorar os métodos específicos de fadiga do basquetebol e recuperação física sob o panorama da COVID-19. Métodos: Foram selecionados aleatoriamente 36 universitários voluntários sem diferenças significativas de altura, peso ou idade para a pesquisa. Divididos em dois grupos, o modo de intervenção do grupo experimental foi a intervenção com rolo de espuma vibratória, enquanto o grupo de controle adotou o método tradicional de caminhada e alongamento. Os dados da avaliação subjetiva da mudança do ácido lático e da fadiga do exercício foram coletados e analisados. Resultados: Em uma hora após o exercício, a taxa e a diminuição do ácido láctico no grupo experimental foram estatisticamente superiores. Antes do início do experimento, a avaliação subjetiva da fadiga no grupo controle foi de (16.031 ± 2.4438) pontos, e a do grupo experimental foi de (16.139 ± 2.7043) pontos. Após o final da nona semana, a avaliação subjetiva da fadiga no grupo controle foi de (14.646 ± 2.7453) pontos, enquanto no experimental foi de (11.576 ± 3.2552) pontos. Conclusão: O método de massagem por rolo de espuma vibratória pode recuperar os atletas da fadiga muscular de forma mais eficiente, respeitando as limitações impostas pela situação epidêmica. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *COVID-19; Fadiga; Recuperação de Função Fisiológica.*

RESUMEN

Introducción: Se solicita una nueva dirección de investigación para fortalecer el baloncesto, mejorar el nivel de la función física y aumentar la inmunidad de los atletas bajo la situación epidémica de COVID-19. Objetivo: Explorar los métodos específicos de fatiga y recuperación física en baloncesto bajo la perspectiva de COVID-19. Métodos: Para la investigación se seleccionaron aleatoriamente 36 estudiantes universitarios voluntarios sin diferencias significativas de estatura, peso o edad. Divididos en dos grupos, el modo de intervención del grupo experimental fue la intervención con rodillo de espuma vibratoria, mientras que el grupo de control adoptó el método tradicional de caminar y estirar. Se recogieron y analizaron los datos de la evaluación subjetiva del cambio del ácido láctico y la fatiga del ejercicio. Resultados: Una hora después del ejercicio, la tasa y la disminución de ácido láctico en el grupo experimental fueron estadísticamente superiores. Antes del inicio del experimento, la evaluación subjetiva de la fatiga en el grupo de control fue de (16,031 ± 2,4438) puntos, y la del grupo experimental fue de (16,139 ± 2,7043) puntos. Al final de la novena semana, la evaluación subjetiva de la fatiga en el grupo de control fue de (14,646 ± 2,7453) puntos, mientras que en el grupo experimental fue de (11,576 ± 3,2552) puntos. Conclusión: El método de masaje con rodillo de espuma vibratorio puede

recuperar a los deportistas de la fatiga muscular de forma más eficaz, respetando las limitaciones impuestas por la situación epidémica. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *COVID-19; Fatiga; Recuperación de la Función.*

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INTRODUCTION

In December 2019, the outbreak of new coronavirus swept the world, impacting the development of the sports industry.[1] Major sports events have been suspended one after another, and all kinds of stadiums and gymnasiums have also stopped operating. Colleges and universities also choose the method of home teaching, which also has an impact on college physical education teaching.[2] In addition, in line with the relevant national policies on closed management, do not go out unless necessary. The time for outdoor sports in the society as a whole is reduced, and people's health problems are highly valued.[3] During the epidemic, the exercise time can not meet the health requirements, the physical function will have a downward trend, and the obesity problem will gradually increase.[4] For basketball events, there are certain requirements for the court. In the form of epidemic, it is difficult to carry out relevant campaigns. After the stable period of the epidemic, I found many health problems in my body when I participated in the basketball games. Long term lack of exercise leads to physical decline. And because of the decline of physical function, the recovery period of physical ability becomes longer, and the sense of exercise fatigue is aggravated, a series of problems also follow. How to effectively manage the movement mode and duration under the epidemic situation is a difficult problem facing the society.[5] In combination with sports science, we will deeply explore how to solve the problem of increasing sports fatigue and long recovery period under the epidemic situation.[6] These problems are urgent affairs to be solved in the sports industry. The goal is to improve the level of body function and enhance the body immunity in the form of epidemic. Design the movement method suitable for the epidemic situation. Colleges and universities can effectively solve the health problems of college students by offering relevant courses and improving the content of such courses. Because basketball is very popular, the number of participants is also very large. Today's problems have made the basketball project develop slowly. For basketball projects, it is urgent to carry out guidance and teaching during the epidemic.[7] Scientific guidance will help solve problems. With the goal of slowing down the fatigue of basketball and strengthening the ability of physical recovery, formulate a plan to solve the existing problems.

METHOD

Research objects

In basketball sports, we should strengthen the regulation of sports fatigue and physical recovery, so that basketball players can maintain a good state of motion after sports, so that the sports ability and body immunity of basketball players can be further improved. The study and all the participants were reviewed and approved by Ethics Committee of North China University of Water Resources and Electric Power(NO.NCUWT18Z04). In order to more specifically explore the adjustment effect of sports fatigue, this paper selected 36 college basketball majors as the research object. As shown in Table 1, 9 students are in the forward position, 12 students are in the center position, 15 students are in the back position, and 36 students have no significant differences in age, height, weight, years of exercise, sports performance, etc., so as to minimize the interference of irrelevant factors on the experimental results. 36 subjects were randomly divided into experimental group and control group with 18 subjects in each group.

Table 1. Selection of research objects.

Position	Number of people	Age	Weight	Height
Forward	9	19.770±1.2333	90.104±2.4369	189.927±4.4560
Center-forward	12	20.398±1.3154	97.845±3.4063	191.624±3.8186
Guard	15	20.379±1.0543	84.391±3.0237	182.064±2.9640

Research methods

• Study duration: nine weeks;
• Subjects: 36 basketball students in physical education college were divided into two groups, including 18 experimental groups and 18 control groups;
• Intervention mode of the experimental group: vibration foam shaft intervention. After basketball training, use the vibration foam shaft to roll the main muscle groups, lasting for 15 minutes;
• Intervention methods in the control group: the traditional stretching jogging method was selected to walk around the field after the exercise, and the stretching of limbs muscles was completed while relaxing, lasting for 15 minutes;
• Experiment frequency: three times a week, lasting for 9 weeks;

Observation indexes: changes of lactic acid and subjective evaluation of exercise fatigue.

Data analysis

Determination of lactic acid change: The lactic acid tester was selected as the testing instrument. At the time points before the start of relaxation after training, after 5 minutes of relaxation, after 15 minutes of relaxation, and after relaxation, sit still for an hour to analyze the change of lactic acid in the process of one hour after training. The experiment was conducted at three week intervals. The data were measured before the beginning of the overall training, that is, week 0, the third week, the sixth week, and the ninth week at the end of the training, so as to analyze the changes in the entire experimental period.

Sports fatigue: in the form of subjective analysis, use the 20 point system to score sports fatigue. Among them, 0~5 points indicate that the body is in excellent condition and can exercise a lot; 5~10 points indicate that fatigue exists, but certain movement can be carried out; 10 to 15 points indicates fatigue, but can complete some simple exercises, and can well complete their own related activities; 15~20 points means very tired, unable to exercise for a period of time, and will have a certain impact on their own related activities at this time. The athletes make subjective evaluation at the one hour point after training, and score their own fatigue state according to the score. The higher the score, the more tired the athletes are.

RESULTS

Changes of lactic acid during exercise fatigue and physical recovery

In this section, the change of lactic acid is used as the judgment standard for fatigue recovery. Table 2 shows the change trend of lactic acid in the experimental process in the form of data, and Figure 1 shows the comparative analysis of the trend in the form of pictures.

Table 2 shows the data collation of lactic acid change trend during the experiment, and the image analysis of its change trend is shown in Figure 1.

Figure a in group 1 shows the change trend of lactic acid in the experimental group. It can be seen from the picture that lactic acid shows a gradual decline within one hour after the end of sports training, and the fastest decline speed is within the interval of five minutes of relaxation. During the next 5 to 15 minutes, when the vibrating foam shaft was still loosened, the lactic acid content still decreased, but the rate of decline was relatively slow compared with the first 5 minutes. During the period from relaxing for 15 minutes to one hour after sitting still, the change of lactic acid showed a relatively gentle trend, with a slight decline. From the time point after the start of the experiment, the athletes' initial lactic acid content showed a certain change trend after the end of the experiment due to the deviation of training intensity during the training process. However, from the rate of lactic acid decline, the rate of lactic acid decline increased with the increase of the experimental cycle, indicating that the massage relaxation of vibrating foam shaft can increase the metabolic rate of lactic acid in athletes. The lactic acid content also decreased during the sitting process from 15 minutes to one hour after the original slow relaxation of lactic acid metabolism, which proved the effectiveness of vibrating foam shaft massage relaxation.

As shown in Figure b, the change trend of lactic acid in the control group. From the overall change analysis, it can be seen that the change of lactic acid still shows a trend of gradual decline in total content and change rate, and the trend of lactic acid basically remains unchanged during the 15 minute to one hour sitting time of exercise training relaxation. It can be seen from the comparative analysis of the changes in the experimental cycle that, except for the different initial lactic acid content caused by different exercise intensity, the other groups of data have little change, indicating that the traditional relaxation mode of walking and stretching cannot produce better optimization effect.

In order to more clearly analyze the changes of lactic acid content in the two groups after the end of the experiment, the article selected the data measurement results of the experimental group and the control group after the ninth week of training for comparison. It can be seen from Figure C that the lactic acid concentration of the two groups of athletes had little difference at the beginning. Within one hour after the exercise, the lactic acid decline rate and the lactic acid decline range of the experimental group were much greater than those of the control group. From 15 minutes to one hour after relaxation, the content of lactic acid in the control group has almost no change, showing a slight downward trend, while the experimental group still shows a significant downward trend, which proves that the experimental group, that is, the vibration foam massage relaxation method, is superior to the traditional stretching and walking forms in promoting the metabolism of lactic acid.

Table 2. Change trend of lactic acid during the experiment.

Group	Time Node	After training	Relax for 5 minutes	Relax for 15 minutes	One hour after training
Experience group	0 weeks	14.152±1.4136	6.314±1.9692	3.600±3.5238	2.999±3.1470
	3 weeks	14.480±2.3765	6.323±2.0089	3.196±1.0346	2.369±1.3670
	6 weeks	15.147±2.1717	5.576±3.1129	4.163±3.1243	2.108±1.2686
	9 weeks	15.704±1.8848	6.717±2.0089	3.492±2.7760	1.859±1.1113
Control group	0 weeks	15.007±1.1697	7.196±3.1924	3.869±2.1618	3.944±2.6429
	3 weeks	15.939±2.2141	7.081±2.0686	4.075±1.1688	4.272±2.6429
	6 weeks	14.915±1.1697	5.671±1.3128	5.027±2.1825	4.886±1.6185
	9 weeks	15.939±1.2428	8.209±3.1029	3.869±2.6376	4.118±2.6429

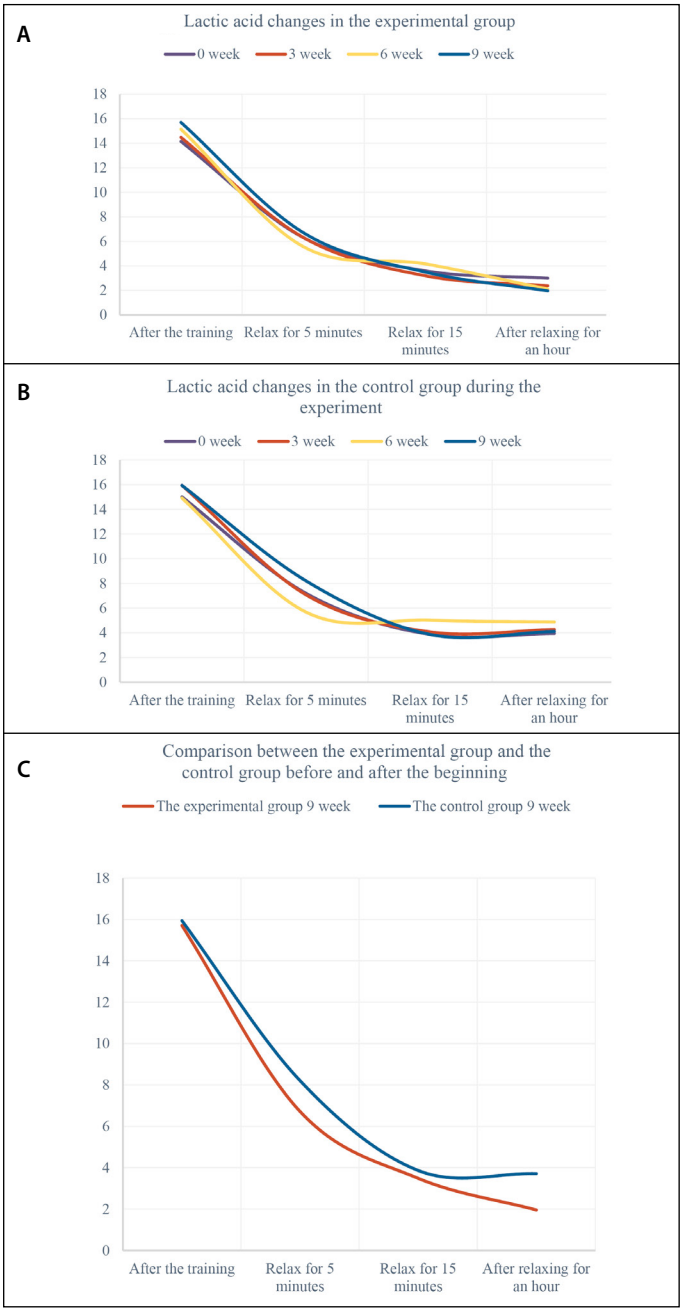

Figure 1. Comparison of lactic acid change trend during the experiment. A: Change trend of lactic acid in experimental group. B: Change trend of lactic acid in control group. C: Comparison of the change trend of lactic acid between the experimental group and the control group.

Change of exercise fatigue during recovery

In the recovery process of sports fatigue, the subjective feeling of athletes is also an important indicator to judge sports fatigue. Therefore, in the study of the effects of sports fatigue and physical recovery methods, the comparison of the subjective evaluation results of athletes was selected. Data sorting and analysis are shown in Table 3.

It can be seen from Table 3 that before the start of the experiment, the subjective assessment of fatigue in the control group was (16.031 ± 2.4438) points, and the subjective assessment of fatigue in the experimental group was (16.139 ± 2.7043) points. There was little difference between the two groups. Three weeks after the start of the experiment, the subjective assessment of fatigue in the control group was (15.877 ± 1.3724) points, and the subjective assessment of fatigue in the experimental group was (12.224 ± 1.2034) points; Six weeks after the start of the experiment, the subjective evaluation of fatigue in the control

Table 3. Comparison of the change trend of exercise fatigue during the experiment.

Measuring point	Control group	Experience group	T	P
0 weeks	16.031±2.4438	16.139±2.7043	4.3341	0.0298
3 weeks	15.877±1.3724	12.224±1.2034	4.8035	0.0393
6 weeks	15.326±2.2859	12.390±2.6224	5.4925	0.0296
9 weeks	14.646±2.7453	11.576±3.2552	5.2652	0.0298

group was (15.326 ± 2.2859) points, and the subjective evaluation of fatigue in the experimental group was (12.390 ± 2.6224) points, indicating that the recovery of exercise fatigue in the experimental group and the control group showed some optimization, but from the overall inter group comparison, it can be seen that the decline of the experimental group was far greater than that in the control group. At the end of the 9th week, the subjective evaluation of fatigue in the control group was (14.646 ± 2.7453) points, and that in the experimental group was (11.576 ± 3.2552) points. In the whole experimental process, $P < 0.05$, indicating a significant difference.

DISCUSSION

Due to the impact of the epidemic situation, all sports venues are generally closed for management. It has brought many troubles to sports. For indoor basketball halls, the method of controlling the number of people in the hall is suitable. Control the number of people in the library to avoid gathering. Do a good job of disinfection in the basketball hall every day. Staffing, responsible for the safety in the basketball hall. Keep the basketball hall well ventilated. In fact, the domestic garbage in the museum should be cleaned up. Secondly, for outdoor courts. People should actively avoid gathering. Keep the mode of small-scale or single training. Wear medical protective masks when entering and exiting the venue. Monitor the body temperature regularly every day. During the epidemic, the exercise should be ended as soon as possible after the amount of exercise meets the health requirements. At home, you can carry out targeted exercises based on the relevant sports attributes of the basketball project. Individual strength training, flexibility training and coordination training can also be practiced at home. These training methods can also effectively improve basketball technical level. It can also effectively solve health problems such as physical decline and fatigue under epidemic situation. During the epidemic, we should ensure good sleep time, reasonable work and rest, and reasonable diet. These details are all related to the design of basketball under the epidemic situation.

CONCLUSION

The COVID-19 epidemic has brought certain risks to offline sports. Therefore, in the process of sports, in addition to strengthening the review of venue access, attention should be paid to regulating the recovery of athletes' physical fitness and sports fatigue. Through effective means of physical recovery, the athletes can prevent physical discomfort during the period of weakness after sports, enhance their physical functions, enable them to better enhance their own immunity, and fight against the threat of COVID-19 virus. In this study, according to the specific needs of sports fatigue and physical recovery, the experimental group of sports recovery with vibrating foam shaft massage method and the control group of sports recovery with traditional walking stretching method are proposed. The research results show that the use of vibrating foam shaft massage can more specifically recover the tired muscle group, thus enhancing the metabolism of lactic acid, improving the subjective fatigue, and making athletes obtain better recovery effects from both physiological and psychological aspects. Therefore, this method is worth promoting.

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